AMENDMENTS TO THE SPECIFICATIONS

Please amend the specifications as indicated:

[0016] FIG. 1 (prior art) shows the different constituents of a fluid filled rock.

FIG. 2 (prior art) shows the arrangement of a measurement-while-drilling system in accordance with the present invention.

FIG 3 (prior art) shows a cross section of a drilling assembly including a sensor assembly in accordance with the present invention;

FIG. 4 shows the use of a thruster assembly below the drill pipe section in the sensor assembly.

FIG. 5 is a flow chart illustrating the use of an expert system for determining lithology and controlling the NMR acquisition, and

FIG. 6 is a flow chart illustrating the training of a neural net.

[0064] Another novel feature of the present invention is the implementation of an Expert Systemin the downhole processor for control of the acquisition parameters. The use of the Expert System **401** is discussed with reference to **Fig. 5.** There are three types of input data to the expert system. First, the Expert System adjusts the acquisition parameters from the NMR **405** data alone. In the simplest example the Expert System may compare the QC indicators, such as the sum of echos at different levels. If outliers are detected, a warning signal is sent uphole.

[0069] In order to benefit from information relating to formation properties, it is

preferable that the other formation evaluation sensors be located between the NMR sensors and the drillbit. With this configuration, measurements made by the other formation evaluation sensors **403** are analyzed downhole and, based upon the rate of penetration, the Expert System **401** knows the properties of the formation being drilled. The FPT gives an estimate of fluid mobility (defined as the ratio of permeability to viscosity). This, when combined with the NMR-determined permeability gives the fluid viscosity. FPT is also evaluating the fluid type - ~~an~~ information which can be used for NMR MWD again by the Expert System to control the NMR acquisition by sending an appropriate signal to the NMR electronics **407, 129**. If the preferred arrangement (other formation evaluation sensors located between the NMR sensors and the drill bit) is not used, then the Expert System changes the NMR acquisition parameters based upon predicted stratigraphy.

[0071] Any changes made by the Expert System **401** in the acquisition and processing parameters are communicated uphole. The operator may then review these changes and, if necessary, override the decisions made by the Expert System.

[0072] The Expert System **401** is preferably implemented using neural networks (NNs). In a preferred embodiment of the invention, more than one NN is used. A first NN is used for determination of lithology and formation fluid type from formation property measurements. A second NN is used for modifying the NMR acquisition and processing parameters based upon the knowledge of the lithology and fluid type and the drilling

conditions. These are discussed separately.

[0073] The first NN that is used for lithology and fluid determination is discussed with reference to **Fig. 6.** The First NN **455** has as one of its input measurements from formation evaluation sensors **453**. As noted above, these can include resisitivity, acoustic, gamma ray, density and neutron sensors. Based upon these sensor outputs, the lithology and fluid content of the formation can be determined by a human **450**. The human's evaluation **451** of the lithology/fluid is compared **461** with the output of the NN. A NN implementation of the lithology/fluid identification involves changing the parameters **459** of the NN to provide a match with the evaluation **451** made by a human expert.